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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/965,904 | 09/28/2001 | J. G. Walacavage | 200-0665 | 4251 |

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| EXAMINER | |
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| ART UNIT | PAPER NUMBER |
|---|---|
| 2123 | |

DATE MAILED: 08/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 09/965,904 | WALACAVAGE ET AL. | |
| | Examiner | Art Unit | |
| | Jason Proctor | 2123 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *02 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 January 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *6/2/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2 June 2006 has been entered.

Claims 1, 9 and 15 are amended. Claims 1-15 are pending in this application.

Claims 1-15 are rejected.

### *Claim Rejections - 35 USC § 103*

In response to the previous rejection of claims 1-15 under 35 U.S.C. § 103, Applicants argue primarily that:

> Taj et al. does not disclose constructing a flowchart that describes interaction of an operator in a workcell using a computer wherein such interaction comprises sequential operations and asynchronous operations, modeling the operator as an input to a programmable logic controller (PLC) by writing a control model of the operator interaction in the workcell based on predefined conditions described in the flowchart, and testing the control model by a PLC logical verification system on the computer as to whether PLC logic for the workcell is correct.
>
> ... LeBaron et al. does not disclose constructing a flowchart that describes interaction of an operator in a workcell using a computer wherein such interaction comprises sequential operations and asynchronous operations, modeling the operator as an input to a programmable logic controller (PLC) by writing a control model of the operator interaction in the workcell based on predefined conditions described in the flowchart, and testing the control model by a PLC logical verification system on the computer as to whether PLC logic for the workcell is correct.

The Examiner has fully considered these arguments and finds them persuasive. The previous rejection of claims 1-15 under 35 U.S.C. § 103 are withdrawn.

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. § 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. § 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 1-15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over "Handbook of Simulation," edited by Jerry Banks (Banks) in view of "Simulation Modeling with Event Graphs" by Lee Schruben (Schruben).

Banks discloses a programmable logic controller verification system [*"Control systems are implemented in software that runs material handling systems. The control system can be as large and complex as a warehouse management system (WMS) or as simple as the programmable logic controller (PLC) that controls a set of conveyor sections. In either case the control system contains decision-making logic that should be tested as early as possible in the design of the system. Many simulation tools include languages that can be used to replicate control system algorithms. Some simulation tools can actually communicate with control system programs directly to help test the code. The earlier that control system defects can be found, the better the material handling system will operate."* (page 539, Section 14.3.6 Control Systems; entire Chapter 14)], comprising:

Writing a control model of the simulation entities [*"Many simulation tools include languages that can be used to replicate control system algorithms."* (page 539, Section 14.3.6 Control Systems)];

Testing as to whether PLC logic for the workcell is correct [*"In either case the control system contains decision-making logic that should be tested as early as possible in the design of the system... The earlier that control system defects can be found, the better the material handling system will operate."* (page 539, Section 14.3.6 Control Systems)]; and

Loading the PLC logic in the PLC controlling the workcell if the PLC logic for the workcell is correct and using the PLC logic by the PLC to operate the workcell [*"Some simulation tools can actually communicate with control system programs directly to help test the code."* (page 539, Section 14.3.6 Control Systems)].

Banks does not expressly teach constructing a flowchart that describes interaction of an operator in a workcell using a computer wherein such interaction comprises sequential operations and asynchronous operations; and

Modeling the operator as an input to a programmable logic controller (PLC) by writing a control model of the operator interaction in the workcell based on predefined conditions described in the flowchart.

Schruben discloses constructing a flowchart that describes interaction of an operator in a workcell wherein such interaction comprises sequential operations and asynchronous operations [*"System Description: An operator is responsible for loading and unloading parts that are processed by a machine as well as freeing a jammed machine."* Sequential operations: *"The machine is loaded and unloaded requiring times $t_l$ and $t_u$, respectively. The time required for the machine to cycle is $t_c$."* Asynchronous operations: *"The (random) machine run-time until the next time the machine jams is denoted by $t_j$. The (random) time required to repair a jammed machine is denoted by $t_r$."* (all from page 959, left column, first paragraph); Flowchart: *"FIGURE 2. Event graph for the Semiautomatic Machine System. Event vertices and state variables are defined in the text."* (page 959, right column, lower right corner)];

Schruben discloses modeling the operator as an input to a machine by writing a control model of the operator interaction in the workcell based on predefined conditions described in the flowchart [*"An operator is responsible for loading an unloading parts that are processed by a machine as well as freeing a jammed machine."* (page 959, left column); *"State variable definition, event definition, and edge conditioning usually proceed simultaneously in developing an event graph."* (page 960, left column, second paragraph); *"An event graph may be used to guide the development of an event-scheduling simulation program. For simple simulation models like the ones considered here, program development may proceed by visually checking the event graph to insure that the simulation model is logically "tied together." For more complex models, a system analysis of the event graph may be helpful."* (page 960, left column, third paragraph); Sections 3-3.4].

Schruben and Banks are analogous art because both are directed to the field of simulation of manufacturing systems.

Therefore it would have been obvious to a person of ordinary skill in the art at the time of Applicants' invention to include the operator and operator's interaction with the PLC-controlled machinery in the PLC logical verification system taught by Banks. This modification could comprise a "simulated operator" pushing a START or RESTART button on a PLC-controlled machine after "freeing a jammed machine".

The motivation for doing so is would be to more accurately model a real system of interaction between an operator and a PLC-controlled machine [*"In discrete-event digital simulation modeling, an analogy is created between a system and a computer program."* (Schruben, page 957, first paragraph); *"The next example is an extension of the first one. A*

*service interruption is modeled here without the use of event canceling edges... We consider a single semiautomatic machine (so the event attribute of machine number can be dropped) that is subject to random jamming."* (Schruben, page 958, right column, Section 2.2)] and to make simulations easier to develop [*"Event graphs should make event-scheduling simulations easier to develop."* (Schruben, page 963, Section 5)].

Therefore it would have been obvious to a person of ordinary skill in the art at the time of Applicants' invention to combine the Schruben and Banks references to obtain the claimed invention.

Regarding claim 2, Schruben teaches that the step of testing comprises starting a timer and determining whether the operator interaction of the flowchart is completed within a predetermined time [*"The (random) time required to repair a jammed machine is dentoed by $t_r$."* (page 959, left column)].

Regarding claim 3, Schruben teaches that the step of testing includes initializing the operator interaction of the flowchart prior to starting the timer [FIGURE 2, node 1, corresponding to Event 1 (page 959, right column)].

Regarding claim 4, Schruben teaches that the step of testing includes idling the operator prior to starting the timer [*"Parts arrive to be processed at (random) intervals of time of length $t_a$."* (page 959, left column); *"Event 1: (part arrival): $P = P + 1$, generate $t_a$."* (page 959, right column); The graph "idles" in the initial node until an event occurs].

Regarding claim 5, Banks teaches that the step of constructing comprises constructing a series of commands for the operator using the computer [*"Many simulation tools include languages that can be used to replicate control system algorithms."* (page 539, Section 14.3.6 Control Systems); entire Chapter 14].

Regarding claim 6, Schruben teaches that the operator has at least one resource [*"Every hour the operator is entitled to a five-minute break, but will take the time only after completing any partially finished work and unloading the machine."* (page 959, left column)].

Regarding claim 7, Schruben teaches that the resource has at least one capability [*"An operator is responsible for loading and unloading parts that are processed by a machine as well as freeing a jammed machine."* (page 959, left column)].

Regarding claim 8, Schruben teaches that the step of testing includes executing the commands when a timer is started [*"Parts arrive to be processed at (random) intervals of time of length* $t_a$*."* (page 959, left column); FIGURE 2; The graph and simulation are defined in terms of timed intervals during which the operator's instructions are executed.].

Claims 9 and 10 recite a combination of limitations found in claims 1 and 2. As claims 1 and 2 are obvious over Banks in view of Schruben, claims 9 and 10 are similarly obvious.

Claims 11 and 12 recite limitations corresponding to claims 3 and 4. As claims 3 and 4 are obvious over Banks in view of Schruben, claims 11 and 12 are similarly obvious.

Claims 13 and 14 recite a combination of limitations found in claims 5-7. As claims 5-7 are obvious over Banks in view of Schruben, claims 13 and 14 are similarly obvious.

Claim 15 recites a combination of limitations found in claims 9-14. As claims 9-14 are obvious over Banks in view of Schruben, claim 15 is similarly obvious.

***Conclusion***

Art considered pertinent by the examiner but not applied has been cited on form PTO-892.

Phillips, "AUTOMOD™ by AUTOSIMULATIONS" discloses a computerized simulation tool for simulating layout and operation of manufacturing, material handling, and distribution systems (page 213, left column). Phillips discloses simulating the operator's interaction with the system [*"Processes can contain complex logic to control the flow of either manufacturing materials or control messages, to contend for resources, or to wait for user-specified times."* (page 214, left column); *"Resources in AutoMod are used to represent machines, operators, fixtures, containers, and any other finite capacity objects."* (page 215, left column)].

Donald, "A Tutorial on Ergonomic and Process Modeling using QUEST and IGRIP" discloses the integration of two computerized tools (page 297) including simulation of the flow of material (page 298, An Overview of QUEST) and simulation of a human operator interacting with machinery (page 299, An Overview of ERGO). Donald discloses a graphical simulation of the operator interacting with machinery [Figure 2; Figure 3; *"As a tutorial example, Figure 3 shows an operator's workplace for picking up a widget from a robotic application and placing the widget in a machine tool."* (page 300, left column)].

US Patent No. 4,510,565 to Dummermuth discloses a programmable controller for closed-loop positioning control (abstract). Dummermuth is concerned with numerically controlled (NC) systems [*"In an NC system for controlling the path of tool motion in three dimensions, the three axes of motion are said to be coupled..."* (column 2, lines 17-29)]. Dummermuth discloses a machine with an operator interface and control functions [*"Operator functions such as START, E-STOP, SLIDE STOP, ESCAPE, JOB FORWARD, and JOG REVERSE can be entered through pushbuttons."* (column 19, lines 23-46)].

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason Proctor whose telephone number is (571) 272-3713. The examiner can normally be reached on 8:30 am-4:30 pm M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached at (571) 272-3753. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the TC 2100 Group receptionist: 571-272-2100. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jason Proctor
Examiner
Art Unit 2123

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8/18/06

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